

1 **CLAIMS**

2 1. A method comprising:
3 partitioning each dimension in a multidimensional (MD) feature
4 space into a plurality of intervals;
5 identifying an interval in each dimension that overlaps a query point;
6 finding one or more MD data objects coupled to the MD feature
7 space that match all of the identified intervals; and
8 evaluating a first MD data object that matches all of the identified
9 intervals to determine whether the first MD data object overlaps the query point.

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11 2. A method as defined in claim 1, wherein each MD data object
12 comprises a hyper-rectangle.

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14 3. A method as defined in claim 1, wherein each MD data object is
15 associated with a data item.

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17 4. A method as defined in claim 3, wherein each data item comprises a
18 media data item.

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20 5. A method as defined in claim 1, wherein each MD data object
21 comprises a hyper-sphere.

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23 6. A method as defined in claim 5, wherein each hyper-sphere is
24 associated with a data item.
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1 7. A method as defined in claim 1, wherein the act of finding
2 comprises:

3 for each interval, forming an associated data structure that indicates
4 the MD data objects that match the interval; and

5 processing each data structure associated with an identified interval
6 to produce a set of MD data objects, each MD data object in the set matching each
7 of the identified intervals.

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9 8. A method as defined in claim 7, wherein each data structure
10 comprises a bit vector index.

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12 9. A method as defined in claim 8, wherein each bit vector index
13 comprises a plurality of bits and wherein each bit in a bit vector corresponds to a
14 single MD data object.

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16 10. A method as defined in claim 9, wherein a hyper-rectangle is
17 associated with each MD data object and wherein each bit in a bit vector index
18 indicates whether the hyper-rectangle corresponding thereto overlaps the
19 corresponding interval

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21 11. A method as defined in claim 8, wherein the act of processing
22 comprises logically ANDing the bit vector indices associated with all selected
23 intervals.

1 12. A method as defined in claim 1, wherein each MD data object is
2 associated with a hyper-rectangle coupled to the MD feature space, and wherein
3 the act of finding comprises comparing the query point with each hyper-rectangle
4 that overlaps all of the identified intervals.

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6 13. A method as defined in claim 12, wherein each MD data object
7 comprises a hyper-sphere.
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1 14. A computer-readable medium having computer-executable
2 instructions for performing acts comprising:

3 partitioning each of a plurality of dimensions in a multidimensional (MD)
4 feature space into a plurality of intervals;

5 for each interval, forming an associated data structure that indicates which
6 of a plurality of MD data objects coupled to the MD feature space match the
7 interval;

8 receiving a query point and selecting an interval in each dimension that is
9 overlapped by the query point;

10 processing each data structure associated with a selected interval to
11 determine a set of MD data objects; and

12 determining a subset of the MD data objects that overlap the query point.
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14 15. A computer-readable medium as defined in claim 14, wherein each
15 data structure comprises a bit vector index.
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17 16. A computer-readable medium as defined in claim 15, wherein the act
18 of processing comprises logically ANDing all of the bit vector indices to
19 determine the set of MD data objects.
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21 17. A computer-readable medium as defined in claim 15, wherein each
22 bit vector index has a plurality of bits and each bit in a bit vector corresponds to a
23 MD data object coupled to the MD feature space.
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1 18. A computer-readable medium as defined in claim 15, wherein each
2 bit vector index has a plurality of bits, each bit in a bit vector corresponds to a
3 single hyper-rectangle and indicates whether the corresponding hyper-rectangle
4 overlaps the interval associated with the data structure.

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6 19. A computer-readable medium as defined in claim 14, wherein the act
7 of partitioning comprises partitioning each dimension into a number of disjoint
8 intervals.

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10 20. A computer-readable medium as defined in claim 14, wherein at
11 least one interval is bounded by two interval dividers.

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13 21. A computer-readable medium as defined in claim 14, wherein at
14 least one interval is unbounded in one direction along a dimension.

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16 22. A computer-readable medium as defined in claim 14, wherein at
17 least one interval of a first of the plurality of dimensions is bound by an interval
18 dividers and wherein the at least one interval divider is selected in accordance with
19 $\text{FirstIDs}_j = j * [(2 * |S|) / m] + j$, where FirstIDs_j represents the location of the at least
20 one interval divider along the first dimension, m is a selected number of interval
21 dividers along the first dimension, $1 \leq j \leq (2 * |S|) \% m$, and $|S|$ equals a number of
22 hyper-rectangles coupled to the MD feature space.

1 23. A computer-readable medium as defined in claim 14, wherein at
2 least one interval of a first of the plurality of dimensions is bound by an interval
3 divider and wherein the at least one interval divider is selected according to
4 $\text{RemainingIDs}_j = j * [(2 * |S|) / m] + (2 * |S|) \% m$, where RemainingIDs_j represents the
5 location of the interval divider along the first dimension, m is a selected number of
6 interval dividers along the first dimension, $(2 * |S|) \% m + 1 \leq j \leq m$, and $|S|$ equals a
7 number of hyper-rectangles coupled to the MD feature space.

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9 24. A system comprising:
10 a data store containing a plurality of data items;
11 a computer readable medium having defined therein a multidimensional
12 (MD) feature space coupled to a plurality of MD data objects, each MD data
13 object being associated with a data item; and
14 a search module operable to:
15 partition each dimension in the MD feature space into a plurality of
16 intervals;
17 select an interval in each dimension that overlaps a query point;
18 determine a subset of the plurality of MD data objects that matches
19 all of the selected intervals; and
20 select a data item based on the query point and the determined subset
21 of MD data objects.

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23 25. A system as defined in claim 24, further comprising:
24 a mapping module operable to map each of the plurality of data items to an
25 MD object coupled to the MD feature space.

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2 26. A system as defined in claim 25, further comprising:
3 a shape approximator module operable to map each MD object to a hyper-
4 rectangle coupled to the MD feature space.

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6 27. A system as defined in claim 25, wherein each MD object comprises
7 a hyper-sphere.

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9 28. A system as defined in claim 27, wherein at least two hyper-spheres
10 are not identical in size.

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12 29. A system as defined in claim 26, wherein at least two hyper-
13 rectangles are not identical in size.

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15 30. A computer-readable medium having computer-executable
16 instructions for performing acts comprising:

17 partitioning each dimension in a multidimensional (MD) feature
18 space into a plurality of intervals, the feature space coupled to a plurality of MD
19 data objects, each MD data object being associated with a data item;

20 identifying an interval in each dimension that includes a query point;
21 identifying one or more MD data objects coupled to the feature
22 space that match all of the identified intervals; and

23 identifying a data item that matches the query point using the query
24 point and the identified one or more MD data objects.
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1 31. A computer-readable medium as defined in claim 30, wherein the act
2 of identifying a data item comprises determining whether each MD data object
3 associated with a data item overlaps the query point.
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